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INTEGRATED FARMING SYSTEM FOR RICE BASED ECOSYSTEM

A.RANGASWAMY, R.VENKITASWAMY, M.PREMSEKHAR,
C.JAYANTHI, S.PURUSHOTHAMAN and SP.PALANIAPPAN

Department of Agronomy, Agricultural College and ResearchInstitute,
Tamil Nadu Agricultural University, Coimbatore 641 003.

ABSTRACT

With the meagre possibility of bringing additional area under plough, it is imperative to produce more for the ever increasing population in the years to come. The study integrated crops with fish, poultry farming and the mushroom production in the lowlands of Tamil Nadu has clearly indicated the best advantage over conventional system of cropping. By way of recycling the waste/uneconomic products of one component over the other, the cost of production of the economic yield of other component is very much reduced thus leading to increased net income of farm as a whole. The study conducted for five years (1987 to 1992) indicated, an additional income of Rs.15330, Rs.11574, Rs.15505, Rs.20530 and Rs.19463 ha^{-1} $year^{-1}$ during first, second, third, fourth and fifth ear respectively over conventional cropping system.

KEY WORDS : Rice, Integrated Farming System, Additional Income.

The population in most tropical countries is increasing by leaps and bounds and that there is an acute need to produce more food from limited patch of land. The green revolution very effectively increased yields of wheat and rice over large areas of exploitation of genotypes, which resulted in increased use of inputs. However, the yield increase come to a standstill after a linear increase initially, thus leading to a defecit for the growing population. Moreover, the ever increasing cost of the inputs and unstabilised income for the produce reaped, the net income of the farmer has come down drastically. This lead to non-adoption of new technologies for increasing the production.

This apparently leads to the adoption of diverse activities, otherwise called as farming system approach, as conventional cropping is subjected to high degree of risk and uncertainity, it provides only seasonal, irregular and uncertain income and employment to the farmers. With a view to mitigate the risks and uncertainties of income from crop enterprises and to reduce the time lag between investment and returns, it is essential that the farmers include such of those enterprises, in their production programme that yield regular and evenly distributed income throughout the year and are not subjected adversely to vagaries of nature (Throve and Galgolikar, 1985).

The conventional cropping system (CCS) followed in the irrigated lowlands of Tamil Nadu, India includes mainly two crops of rice during monsoon followed by pulse or greenmanure crop. The income from this system is hardly sufficient to sustain a farm family. For assured regular income and decent living, the farmer has to think of other enterprises which will complement cropping activity. This is made possible through optimal crop and livestock mix, consistent with the farm resources immediately available. Therefore, the present integrated farming system (IPS) research was conducted to evolve a economically viable and sustainable farming system for the small and marginal farmers.

MATERIALS AND METHODS

Experiment was conducted in rice based IFS in wetlands of Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore during the year 1987-1992. The components included were cropping, fish culture, poultry and mushroom production. The details of the treatments followed are furnished in Table.1. An area of 0.40 ha was selected for this IFS study considering the small and marginal farmers of Tamil Nadu state, India. For comparision,CCS as practised by farmers was taken up in an area of 0.40 ha. However, the economics and the labour requirement for both the systems were computed to one hectare and furnished in the tables appropriately.

The soil was clay loam (Typic Haplustaff) low (212 kg ha^{-1}), Medium (12.5 kg ha^{-1}) and high (540 kg ha^{-1}) in available N, P_2O_5 and K_2O respectively. The pH, EC, CEC and organic carbon were 7.9, 0.30 m.mhos/cm, 35.0 me/100gm and 0.70% respectively. The recommended cultural

Table 1. Treatment details of integrated farming system and conventional cropping system.

Details	Area in ha.	No.
Integrated Farming System (IFS)		
Cropping Programme		
1. Rice (IR 50) (May-Aug) - Rice (IR 20) (Aug-Dec) - Maize (Co1) (Jan-Apr.)	0.16	
2. Rice (IR 50) - Rice (IR 20) - Groundnut (Co^2)	0.10	
3. Maize (Co 1) - Rice (IR 20) - Sesamum (TMV_3)	0.10	
Fisheries		
Fish pond (including mushroom shed)		
1. Silvercarp/Catla (Surface feeder)	0.04	120 (4)
2. Rohu (Column feeder)		60 (2)
3. Mrigal/common carp (Bottom feeder)		90 (3)
4. Grass carp (Grass feeder)		30 (1)
Poultry		
Bapkok layer		20
Mushroom shed		
(Production capacity 1.5 to 2.0 kg/day)	5m x 3m	
Conventional Cropping System (CCS)		
Rice (IR 50) - Rice (IR 20) - Green gram (Co 3)	0.20	
Rice (IR 50) - Rice (IR 20) - Greenmanure (Sunhemp)	0.20	

practices followed in this tract was adopted for different crops.

Fish pond was excavated and the depth of the pond was 1.5m. Fifteen day old fingerlings belonging to the species *via.*, silver carp (60) (*Hypoohtha michthys molitrix*) Catla (60) *Catla catla*, Rohu (60) *Labeo rohita)*, Mrigal ($5) *Cirrhinus mrigala*, commoncarp (45) (*Cyerinus carpio*) and grass carp (30) *Ctenopharygodon idella*) were stocked in the fish pond. Accordingly the stocking density of fingerlings works out to 7500 ha^{-1} of ponded water. No artificial feeding was given to fingerlings.

A poultry shed having plinth area of $2.2m^2$ was erected over the fish pond at one corner. Bottom of poultry shed was provided with wire mesh (3mm x 3mm) to facilitate free falling of poultry dropping into the pond. Twenty numbers (500 ha^{-1}) of eighteen week old Bapkok chicks were kept in the poultry shed. The composition of the poultry feed was rice bran 35, maize flour 25, groundnut cake 12, seasamum cake 7, alfalfa 3, molasses from sugarcane 3, fishmeal 6, mineral mixture 2.5 and shell grit 4.5 per cent; and feed requirement at different stags of birds was 80 upto 20 weeks, 95 at 25% egg production, 105 at 50% egg production, 110 at 60% egg production 115 at 70% egg production at and 120 g/bird/day at 80% egg production and above. The poultry feed components viz., mineral mixture, shell grit, molasses and fish meal were purchased from

Table 2. Statement showing the receipt, expenditure and net income for 1987-88, 1988-89, 1989-90, 1990-91 and 1991-92 in integrated farming system and conventional cropping system

Years	Receipt	Rs.ha^{-1} Yr^{-1}	Expenditure	Rs.ha^{-1} Yr^{-1}	Netincome	Rs.ha^{-1} Yr^{-1}
	IFS	CCS	IFS	CCS	IFS	CCS
1987 - 88	61232	36952	24084	15104	37148	21848
1988 - 89	70518	46512	29120	16688	41398	29824
1989 - 90	58696	28288	29683	14800	28993	13488
1990 - 91	82720	31190	47450	16254	35270	14740
1991 - 92	74928	24290	47425	16250	27503	8040
Mean	69619	33446	35552	15819	34067	17588

Net income Rs. ha^{-1} day^{-1} (Mean of five years)

IFS : Integrated farming system; CCS : Conventional cropping system

Table 3. Employment generation in integrated farming system and conventional cropping system (mean of five years).

System	Mondays ha^{-1} Yr^{-1}
Integrated farming system (IFS)	1338
Conventional cropping system	930
Additional mandays generated under IFS	453

outside agencies at market price. In the year of start, rice bran, maize flour, groundnut cake, sesamum cake and alfalfa meal were worked out at production cost. Recycling of farm waste and produce from the crop component was tried for the preparation of poultry feed specified, in the second year onwards. The alfalfa meal utilised in the poultry feed was raised around the fish pond. The experiment was started during 1987 and the fifth year programme was completed during 1992. The economic yields from crops were recorded after harvest. The growth rate of fish was recorded at monthly interval by collecting 20 fingerlings at random. Live weight of all the birds were taken at monthly intervals birds started laying eggs around 22nd and were culled at the age of 72nd week when the egg production become uneconomical. A mushroom shed size of 5m x 3m was constructed with locally available materials to produce 1.5 to 2.0 kg of mushroom per day and the production started from the year 1988-89.

RESULTS AND DISCUSSION

The mean weight of the fingerlings increased continously with the increase in age and reached maximum around tenth month. It ranged from 2g at initial stage to 950g at tenth month. The growth of fingerlings was solely due to the droppings of the birds kept over the fish pond. The poultry droppings contain protein 30%, fat 2.5%, crude fibre 13.1 nitrogen free extract 30.5% and total ash 24.0 per cent and Ca,P,Na and K 4.6, 3.0, 0.4 and 1.4 per cent and Cu, zn and Mn 61, 325 and 291 ppm respectively on drymatter basis. The poultry droppings found to enhance the nutritive value when compared to periodical fertilization and supplemental feeding of fish with groundnut cake and rice bran. The better growth of fingerlings feed with poultry dropping was reported by Delmendo (1980), Banerjee et al., (1979), Joseph (1981), Kumar and Singh (1984) and Sharma et al (1985).

The body weight of birds increased upto eight months of its age and it was maintained till culling. No mortality of birds observed till the end of the culling. This may be due to the cool environment created by the fish pond.

In rice cultivation even with best management practice about 5-7 per cent illfilled or partly filled grains are obtained. This waste product of rice when it is hulled becomes 35 per cent of poultry feed. Similarly, by using the maize grain of the farm the cost of poultry feed can be reduced to certain extend. The economics worked out for the system as a whole reveal that under IFS and CCS, the net income were Rs.37,148 and Rs.21,848 during the first year, Rs.41398 and Rs. 29824 during second year and Rs.26993 and 13488 during the third year, Rs. 35270 and Rs. 14740 during fourth year and Rs. 27503 and Rs. 8040 per ha per year during the fifth year respectively. This gave an additional income of Rs. 15330, Rs. 11574, Rs.15,505 Rs. 20530 and Rs.19,463 during first, second, third, fourth and fifth year respectively (Table 2). Out of gross income obtained from the IFS 59.2 per cent from cropping 8.3 % from poultry, 7.5 per cent from fisheries and 25.0 per cent from mushroom production (mean of five years). The additional net income realised from IFS was 16481 ha^{-1} Yr^{-1}. The net profit workedout under IFS was 93.33 $hapt^{-1}$ day^{-1} and it is 100 per cent higher than CCS.

By converting the groundnut and sesamum seed into its product *viz* oil and cake, the cake can be made free of cost to the poultry feed component and thus can reduce the cost of poultry feed. The poultry feed cost can be reduced by about 57.5 per cent by substituting the illfilled or partly filled grain of rice, maize grain of the farm, oil cakes of the crop component and the alfalfa grown around the fish pod. The reduction in feed cost by way of effective recycling the products of crop component, leads to reduction in feed cost by way of effective recycling the products of crop component, leads to reduction in cost production of egg. It works to Rs.34 as against Rs.60 per egg in the conventional poultry farm. The additional employment generated through IFS over CCSs was 453 mondays ha^{-1} $year^{-1}$ and it was 48 per cent higher than the CCS (Table 3)

It can be concluded that adopting an integrated farming system combining cropping, poultry, fisheries and mushroom production enhance the net income of the lowland rice farmer.

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SAND GRAIN MINERALOGY OF THE SOILS OF LOWER BHAVANI PROJECT COMMAND AREA

P.PARAMASIVAM

Water Technology Centre, Tamil Nadu Agricultural University, Coimbatore 641 003

ABSTRACT

The study of the soils of Lower Bhavani Command Area revealed that the total light minerals in coarse sand fractions are in the range of 96-97, 92-96, 93-96, 87-92 and 94-97 per cent in Irugur (Igr), Sathyamangalam (Sty), Kangayampalayam (Kgp), Koduveri (Kdv) and Peelamedu (Plm) series, respectively, In fine sand fractions they are in the range of 91-96,91-98,94-97,84-90 and 92-95 of per cent in these series. Generally light minerals dominate distinctly over the heavier ones due to relative resistance or weathering of the former. Quartz predominates over the other light minerals. Surface horizon showed more quartz than feldspar. The total amount of heavy minerals in both fractions is the least in Igr followed by Plm, Sty and Kdv series.

KEY WORDS : Sand Grain Mineralogy, LBP soils.

The composition and mineralogy makeup influences the physical and chemical properties of soil. Mineralogical analyses serve as an effective guide for planning the reclamation processes. Also, mineralogical investigations provide an opportunity to develop a better understanding of weathering and pedogenic processes. Further, they form a strong basis for sustainable crop production. The mineralogy studies of soils of Lower Bhavani Project (LBP) area are much inadequate and hence the present study was under taken to investigate the sand grain mineralogy of LBP Command Area.

MATERIALS AND METHODS

The Lower Bhavani Project Command Area covering the taluks of Sathyamangalam, Gopichettypalayam, Bhavani, Perunthurai, Kangayam, Erode of Periyar District of Tamil Nadu lies between $77^0$2 to $77^0$6 E and $11^0$28 to $12^0$00 N. This study area lies 171.91m above sea level. The slopes ranged from 3 to 8 per cent. The study area experiences mean annual precipitation of about 685 mm, 50 per cent of which is received during September, October and November while January to April are the driest period. The mean annual winter and summer temperature are 32.2,30.5 and 34.7^0 C, respectively. The soil temperature and moisture regimes are"Isohyperthermic and Ustic" respectively. The physiography of the area generally has terraced conditions slopping towards Bhavani river which serves as draining line.

The natural vegetation of the area comprises of nut grass, hariyalli grass, *Acacia* and neem. The geological formation of the study area consists of rocks of Dharwar age followed by charnokites and peninsular gneiss. Five pedons at the rate of one each of the five soil series, *viz;* Irugur (Igr), Sathyamangalam (Sty), Kangayampalayam (Kgp), Koduveri (Kdv) and Peelamedu (Plm) were studied for the present investigation.